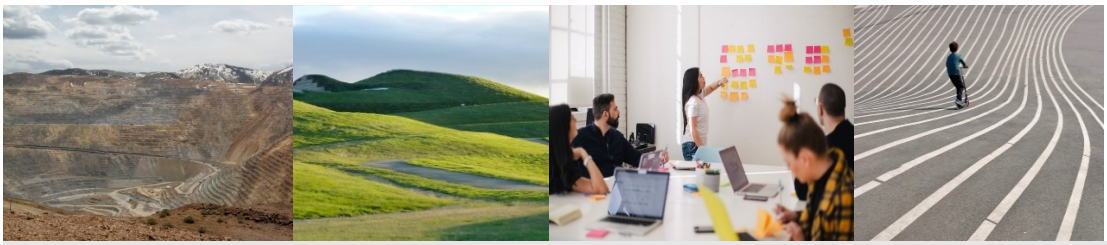
ReviRis
Revitalising Post-Mining Regions



D4.2 Elaborating models of revitalization in the post-mining region

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D4.1 Elaborating models of revitalization in the post-mining region

Summary

This report shows the different approaches to remediation and revitalization in different RIS countries. Selected proven European models of regional revitalisation (Ruhrarea, Lusatian Basin and Nord-Pas de Calais) were characterized. On the basis of existing experience and analysis of country's specific conditions concerning reclamation and revitalisation a model of revitalization in the post-mining region was developed. It is universal and can be used in various countries.

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1 INTRODUCTION

Mining activities are significantly transforming the environment. Regions dominated by this industry, sometimes operating for centuries, require specially designed activities to achieve the expected environmental, economic and social effects. It is difficult to obtain them by single reclamation and revitalization measures. Unfortunately, not every (post) mining region has comprehensive revitalization programs. This will be examined in the frame of this report.

The approach to revitalisation of post-mining areas may have three scales:

- **national** - usually concerns a selected aspect, e.g. protection of industrial heritage, land pollution, in this case initiatives are supported by ministries;
- **regional** - covering all or most of the post-mining areas in the region with one coherent program, e.g. IBAs in Germany;
- **local**, understood as the revitalization of **individual** post-mining areas, can be supported by regional authorities.

This report deals with the **regional approach**. The objective of this report is the elaborate models of revitalization in the post-mining region. The model will be built on the basis of existing practices that have been already verified in European post-mining regions. Models will be assessed in terms of environmental and socio-economic effects for the region as a whole. A list of formal-legal, financial, organizational tools as well as good practices will be drawn up and then helps to build a universal model. Problems that take place in RIS countries and interfere with comprehensive revitalization will be subjected to detailed analysis.

As a background selected proven European models will be characterized:

- IBA Emscher Park together with NRW.URBAN as dedicated companies for rehabilitation and socioeconomic development – Germany;
- IBA Fürst-Pückler-Land together with LMBV as a dedicated company for rehabilitation – Germany;
- Etablissement Public Foncier – France, a company dedicated to post-mining rehabilitation;
- IBA Parkstad – Netherlands.

The way of organizing mentioned programs as well as the effects and success factors will be described. Against this background, the experience of the RIS countries: Greece, Estonia, Poland, Portugal, and Spain will be thoroughly analysed. As mentioned before, they have not been sufficiently comprehensive and consistently implemented. The previous experiences of RIS countries, as well as the tried-and-tested comprehensive German and French models, will be the basis for building or improving models for RIS countries.

2 METHOD

The method of preparing models of revitalization in the post-mining region will be based on desk research and field study, in detail:

- Analysis of legislation and experiences of partner countries in revitalization on a regional scale
- Existing practices that have been already verified in European postmining regions
- Experiences from scientific and technical internships in the institutions dealing with implementation of a comprehensive model of revitalisation at the regional scale.
- Analysis of scientific publications and official websites.

Regarding the field trip, project partners relied on trips abroad prior to the pandemic (Ruhrarea, Lusatian Basin, Nord-pas de Calais).

3 EXPERIENCES OF PARTNER COUNTRIES IN REVITALIZATION ON A REGIONAL SCALE

3.1 Austria

All mining activities in Austria, including regeneration/revitalization/renaturation, are based on the “Mineral Raw Materials Act” (Mineralrohstoffgesetz - MinroG; BGBl. I Nr. 38/1999). When we take a closer look at the law, we soon realise that it is basically very clear what has to be done with mining operations that are about to be closed down:

First of all, the law in Austria distinguishes between 3 types of mineral raw materials:

- - § 3. (1) “Mountain-free” mineral raw materials (iron ores, tungsten, precious metals and other ores, rare earth elements, gypsum, baryte, graphite, talc, coal, oil shale, high purity limestone, diabase, …)
- - § 4. (1) “State-owned” mineral raw materials (halite, hydrocarbons, mineral raw materials containing uranium and thorium)
- - § 5. “Land-property” mineral raw materials (construction raw materials and all other mineral resources not listed in §§ 3 and 4).

§80 tells us, that if “someone” intends to extract “land-property” mineral raw materials from above ground, a mining operation plan must be submitted to the authority for approval. No mining operations may begin before the extraction operating plan has been approved. On the part of the applicant, this extraction operation plan must also be accompanied by planning documents which include the protection of the surface and the safeguarding of surface use after the end of mining activities.

§116 (11) When approving a mining operation plan, the authority may require that the holder of a mining license, when commencing mining operations, ensures that the expected costs of measures to protect the surface and to secure surface use after completion of mining operations, are covered. This “Security” can be provided in any form (guarantee, insurance, land register security, etc.), as long as it is suitable and sufficient.

With this instrument of "safety performance", the authority can control recultivation measures very well respectively ensure their implementation.

§114 (1) When mining activities are discontinued, the holder of the mining license has to submit a final operating plan to the authority for approval, which in particular also includes documents on the protection of the surface in the interest of the safety of persons and property, as well as measures such as the necessary precautions for the rehabilitation of the surface.

§159 (1) The holder of the mining license must take appropriate measures to safeguard the use of the surface after the end of mining activities. He must restore foreign land and parts of land required for mining purposes to their former condition, unless they have been used for the extraction of mineral raw materials. If the restoration of the former condition cannot be achieved or is not economically justifiable, or if such an existing regional development plan contradicts such a plan, the plots of land and parts of plots of land are to be made usable again for other purposes. Land and parts of land on which mineral raw materials have been mined must be designed in a manner that protects nature and is compatible with the landscape.

This is the legal basis for recultivation in Austria and is implemented with great success in most cases: One example that should be highlighted here is the successful cooperation of the "Forum Rohstoffe" with the NGOs "Birdlife" and "WWF" to create secondary habitats for endangered animal and plant species in closed quarries. Another good practice case study is the “Schwarzl Recreational Area”, a former gravel pit that was transformed into a bathing lake with versatile infrastructure for leisure activities and a large event location. Or let’s take the shopping center “Seiersberg”: Today's 200 shops on an area of more than 74000 square meters do not make anyone think that there used to be a gravel pit here in the past. Austria is a country of self- and local suppliers, especially in the field of construction raw materials (gravel, sand, clay, ...). Accordingly, there are many quarries and gravel pits throughout the country. In addition to the already mentioned possibility of a local recreation area for tourists, closed quarries often offer ideal conditions for excavated soil landfills. Often this also results in an upgrading of the soil, which in turn creates new forest or agricultural areas that require less artificial fertilizer and irrigation and are therefore gentler on groundwater than some other natural arable land. If we also take into account during recultivation which minerals are released by the soil/rock mass and based on our current state of knowledge about the complex interrelationships of flora and fauna, we can create very simple a good microclimate to promote natural succession, with some initial plantings at relatively low cost. Austria is blessed with a very species-rich flora and fauna. The fact that raw material extraction and nature conservation are by no means in the way of each other, is also shown by the much-practiced renaturation measure of "replacement afforestation". This means that if a forest area is permanently cleared by mining activities, a corresponding compensation area "somewhere else" can/must be planted with forest (nowadays the ecologically more sensible mixed forest is preferred to commercial forest). From time to time, however, conflicts of interest and opinion do arise between landscape protection/landscape design and the challenges posed by rock mechanics. But on the whole, Austrian raw material extraction goes hand in hand with the protection of our nature and environment.

3.2 Greece

The mining industry in Greece is presently regulated by the Mining Code (Legislative Decree 210/1973, as amended) and the Regulation on Mining and Quarrying activities (Ministerial Decision 12050/2223 of 2011). Additional regulations include the forestry legislation as well as the European directives on the environmental impact assessment (EIA), the NATURA habitats, and the management of extractive waste.

Mine closure planning is an integral part of the authorization procedure as it is included in the stage of EIA approval. In this stage, even before mineral extraction begins, the operator has to state in his operation plan the measures required for mine reclamation. The area affected must be rehabilitated as soon as it is feasible, in parallel with the exploitation of the mine or quarry. The final form of rehabilitation should be integrated with the surrounding environment. In cases of public, municipal areas, local needs for special land use have to be taken into account according to the guidelines from Regional and Municipal government.

Greek Mining code does not provide for alternative uses of the mine site after the end of the life of the mine. One of the key challenges for the mining policy in Greece is to show that places

with mining history have a wide range of applications and are not a negative factor in the development of the area. Although there is a lack of a regular procedure in this field, there are some successful examples of mine revitalisation, implemented mainly by mining companies such as:

- Ancient quarries of Dionyssos turned into an open Museum: The ancient quarries of Dionyssos, located at Pentelikon mountain, Attica, the source of the marble used to build the Parthenon, have been made accessible to the public through a series of paths built from the plentiful waste rock scattered about site.
- Vagonetto Fokis Mining Park: A former underground bauxite mine site in Central Greece after closure has been transformed by the mining company (Imerys S.A) in a mining park providing a valuable educational and entertaining experience for children, young people, teachers and families.
- Wide range of uses of old lignite mines: At the West Macedonia Lignite Center in northern Greece 100 hectares of depleted lignite mine have been put to a wide range of uses by the Public Power Corporation (PPC), including an exhibition center, visited by more than 5000 people per year, an artificial wetland, which is aimed for use as an environmental education reserve, an open-air theatre, a silviculture park, a railway history park, a biomass crop plantation, a small animal reserve and a leisure park and lake, attracting therefore a diverse set of visitors and developing multiple economic activities in a region that still hosts active lignite mines nearby. Respectively, at the Megalopolis Lignite Center, similar uses have been developed, including an Expo Center, a recreational park, artificial wetlands, a motor cross track and a runway used by ultra light aircrafts.
- Lavrion Technological and Cultural Park (LTCP): The industrial complex of French Mining Company of Lavrion (FMCL) operated for more than a century (1875-1981) has been transformed from the National Technical University of Athens (NTUA) into a Technological and Cultural Park.

3.3 Poland

Currently, there are over 7,000 mines exploiting metallic, rock, chemical and energy minerals. Mines occurred in various regions and basins, for example: Legnica-Głogów Copper District, Silesia-Krakow Zinc-Lead Area, Upper Silesian Coal Basin, Lublin Coal Basin, Lower Silesian Coal Basin, White Basin (limestone) and other less formal such as sand and gravel exploitation areas (mainly from under the water table) as a consequence of exploitation, artificial lakelands are created. Unfortunately, none of the basins or post-mining regions was included in the revitalization program. The only attempt concerned a consistent revitalization of water reservoirs after the exploitation of sand and gravel in the Tarnów subregion, covering four counties. The concept of revitalization was developed on a sub-regional scale (the reservoirs were grouped into thematic complexes), on an urban and architectural scale. The proposed solutions balanced the needs of the environment, economy and society, and were characterized by innovative solutions. The coherent operation of many different facilities with a complementary leisure offer would give a synergy effect. Unfortunately, this bottom-up initiative, was not supported by the region, was not implemented, despite significant advancement (e.g. several building permits) and obtaining external funds for the first stage.

Summing up, Poland can be proud of many good post-mining area revitalization projects. However, these are single projects that do not give the same effects as regional or sub-regional revitalization programs.

3.4 Portugal

In Portugal, regarding abandoned mines, the state-owned entity EDM – Empresa de Desenvolvimento Mineiro ([EN] MDC – Mine Development Company) is responsible for the environmental control, remediation, and reclamation process of all abandoned metal mines. In 2011, EDM along with DGEG (Directorate-General of Energy and Geology) published a book with detail information about the Portuguese approach for the recovery of abandoned mines, entitled “The legacy of abandoned mines”.

In the book the national strategy to reclaim abandoned metal mines is explained. It started with the inventory of 175 abandoned and degraded mining areas and a Baseline Study. The inventory was published in the decree-law nº 198-A/2001 (EDM & DGEG, 2011).

As in the book referred above, the main objectives of this national strategy are the following:

- Listing of the abandoned and degraded mines, completed in 2001 with a list of 175 sites.
- Baseline study with technical-scientific analysis to allow for a proper hierarchy of the sites, according with specific criteria (developed in 2003).
- Launching of works whose projects, after revision, might be available. This is a working process.
- Positioning of the company with the Portuguese Operational Programmes, supported by the European Community, to allocate funds to the projects to be developed.
- Development of Qualification Assessments, Master Plans, Environmental Assessments and Execution Projects that would sustain investment decisions and their priority, comprise the rules of project financing and establishing medium-term action plans.

3.5 Spain

Spain is a pioneer in the regulation of rehabilitation activities of post-mining areas, in order to assess the environmental impact and to economically guarantee the restoration of these areas (“Real Decreto” in the list of references). Since 1982 these regulations require the operator to implement a restoration project and to comply with economic guarantees to ensure its execution. In addition, materials to be used in such restoration projects are regulated by a national normative (Alberruche del Campo et al., 2018).

The techniques of environmental restoration in Spain have evolved in the last decades, from purely engineering solutions to more sophisticated projects able to mitigate the visual impact and to integrate environmental and ecological concepts with social/economic revitalization of the mine areas (Pardo Abad, 2019). Within this frame, different types of restauration projects have been applied: geomorphological restauration (landscape, agriculture, livestock), educative activities (mine, history and archaeology museums), recreative activities (golf courses, natural parks, zoo), therapeutic installations, productive activities (fish farms in mine lakes). All these activities generate both direct and indirect jobs (tourism, school visits) that contribute to preventing population exodus.

Two emblematic examples of revitalization of post-mining areas can be highlighted: Almadén and Cardona. The Mining Park of Almadén is the heritage of two thousand years of Mercury mine exploitation. These are the oldest mines in the world whose activity has been maintained up to this century. After the closure of the mining activity in 2003, the exploitation area was reconverted into a Museum. Mercury related information is shown in the Park in all its aspects: extraction, transformation, metallurgical furnaces, physical and chemical properties, uses and history.

The second example is the old facilities of Mina Nieves, one of the most important potassium salts mines in Europe, until 1990. The mine area is now a museum that clearly represents the revitalization of this area. Visitors can visit the mining well and contemplate the mine machinery, the old carpentry. The most attractive activity for tourists and scholars is the visit to the Saline Valley, at 86 meters of depth, where an incredible saline outcrop, the Salt Mountain, can be admired. The table below describes the most relevant cases of rehabilitation/revitalization in Spain.

***Table 3-1**: Examples of rehabilitation and revitalization of mine areas in Spain (own study)*

Type of restoration/ rehabilitation	Type of mining	Number of sites	Examples	Link to more information
Geomorphological restauration (landscape recuperation, agriculture, livestock)	Sand, clay and stone quarries	More than 9	La Revilla, La Higuera, Somolinos, Toledo, El Machorro, María José, Arlanza, Tortosa, Nuria	http://www.landformining.igeo.ucm-csic.es/es/content/ejemplos-de-rgm-en-espa%C3%B1a
Museums (mines, history and industry)	Carbon mines	More than 15	El Entrego, Bustiello, Pozo Espino, Escucha, Barruelo, Minas de Cercs, Arnao, Utrillas, Utrillas, Mina Mequinenza, Pozo Soton, Pozo Norte, Pozo Fondón MWINAS, Pozo Julia, Lago Meirana, Lago As Pontes	https://www.amuminas.com/museos-mineros-espana/
Museums	Iron	More than 6	Museo del Pais Vasco, San Blas de Sabero, Mina Esperanza, Mina La Jayosa, Parc Miner del Maestrat, Mina Romana Cueva del Fe	https://www.amuminas.com/museos-mineros-espana/
Museums	Metals (Au, Ag, Cu, Hg, Sn, Mn)	More than 15	Almadén (Hg), Río Tinto (Cu), La Unión (Sn), Mina Eugenia (Pb), Hiendelaencina (Ag), Arditurri (Fe, Pb, Zn), Tharsis (Cu), Las Medusas (Au),	https://www.amuminas.com/museos-mineros-espana/

			Navasfrias (W), El Soplao (Zn, Pb), Puras de Villafranca (Mn), etc.	
Museum	Semipreciou s stones	Several small sites	Minas de Gavá (mines and archaeology)	http://patrimoni.gencat.cat/es/coleccion/minas-de-gava
Mine Lakes	Carbon mines	Several, some of them have restrictions for recreational activities due to water contamination	Lago Meirana, Lago As Pontes	https://www.endesa.com/es/proyectos/todos-los-proyectos/eficiencia-energetica/medioambiente/mineria-restauracion-minera
Natural parks, Recreative activities (golf courses, speleology),	Iron	More than 6	Cabárceno (Natural reserve), El Soplao (speleology), Mina romana Cueva de Hierro (speleology), La Arboleda (paddy golf)	https://salinardenaval.com/; https://meaztegigolf.eus/
Therapeu tic centers, museums	Salt mines	More than 5	Cardona (KOH), Lagrosán (phosphetes), La Mora Encantada (yeso), Salinas de Naval (therapeutic spa)	http://entrades.cardonaturisme.cat/es/producte/visita- pcms;

The National Industrial Heritage Plan (described in Del. 1.1) is an example of a comprehensive approach to brownfield sites in Spain. It is a document very valuable from the point of view of revitalization, however, it is limited to the inventory and not the implementation of the resulting guidelines.

4 CASE STUDIES

4.1 IBA Emscher Park and NRW.URBAN as dedicated companies for rehabilitation and socioeconomic development – Germany

4.1.1 Genesis of creating a program or institution for the regional revitalization

One of the most industrialized zones in Germany is the Ruhr area. During the industrial revolution in Germany, since about 1850, the Ruhr area grew rapidly from virtually nothing in the early 19th century founded upon coal, iron and steel and later chemicals. The Ruhr's development was driven by massive, locally based industrial corporations such as Krupps and Thyssen and governments have historically supported this heartland of Germany's economy (Landry, 1999). For more than 100 years, hard coal from domestic production was the basis for industrial success in Germany, even after World War II, when Germany started its “economic miracle”. In the 1960’s and 1970’s it was becoming apparent that the coal and steel economy was in terminal decline because of relatively high production costs. In 2007, the German government decided to stop financial support for the coal mining industry in 2018 (Kretschmann, 2013). The decline of the heavy industry had severe consequences for business and people in the area. The Krupp blast furnace in Duisburg with its 4000 workers closed at the beginning of 1988 bringing about mass protests aiming at reversing the decision. The then city mayor sought support for more innovative forms of employment, which would provide jobs for the future, in turn opening the way for the International Building Exhibition (IBA) initiative. The Term “International Building Exhibition” referred to the German tradition of building exhibitions. In 1989 the state government of North Rhine-Westphalia has initiated the IBA Emscher Park, an extraordinary 10 year regional strategy to re-structure a part of the Ruhr region, the Emscher, which had been suffering the most from economic, environmental and social decline for many decades. The IBA Emscher Park is a program of the Ministry of Urban Development, Housing and Transport for the Land Northrhine-Westfalia. The overall goal of the program was urban development, social, cultural ecological measures as the basis for economic change in an old industrial region (Shaw, 2002).

4.1.2 Organizational and financial form of the program or institutions

The IBA Emscher Park program began with a call, by the Ministry, for single project proposals from all sectors of society, including the towns, companies, pressure groups, individuals and so on. Coordination of the programme was undertaken by IBA GmbH, a public limited company and a subsidiary of the Land Northrhine-Westfalia. The role of the company was to act as quality control for individual initiatives rather than to implement projects (Shaw, 2002). The aim was to give the central Ruhr area impulses for a conceptual structural change, responding to the industrial decline of the region. Landscape planning and urban development projects covering over 800 square kilometers were implemented for the ecological, economic and cultural renewal of the former industrial region (International Bauausstellungen, 2020). Decisions regarding project selection were made by a steering committee consisting of ministers, public bodies, trade unions, towns, companies and environmental, planning and architectural bodies. Promotion of the initiative and academic input came from the Board of Trustees, comprising key figures from the community and the Minister President.

In retrospective, the achievements of the IBA Emscher Park initiative, for which the state government has spent more than 3 billion DM, which is around 1,5 million €, have been impressive (Kunzmann, 2018). In addition to state funds, in particular federal and EU funds were used for financing. Overall, more than 40 existing subsidy programs were regrouped purposefully to finance the projects of IBA Emscher Park. Main elements of IBA Emscher Park project are given in Table 1.

***Table 4-2**: Elements of IBA Emscher Park project*

Parameter	Desciption
Area	Ruhr Region, 2 million population
Actors	Local government, Regional government, Public – private partnership
Funding	Local government, Regional government, National government, European Union, Economic Sector, NGO, Public – private partnership
Topics	Architecture and construction, Business and Industry, Employment, Housing (and new settlements), Land use and planning, Nature and open space, Urban renewal/Urban rehabilitation, Water
Objectives	Improve intersectoral cooperation, Increase bio-diversity, Increase green areas, Increase public awareness
Instruments	Demonstration and pilot project

(source: https://p2infohouse.org/ref/24/23350.htm)

4.1.3 Effects

Five target- themes were followed during the IBA- time (Seltmann, 2007, Shaw, 2002), Figure 1:

- The Emscher Park, a project encompassing the 17 towns and cities in the region with the aim to develop a large park area between the cities and inside the cities.
- The ecological regeneration of the Emscher river and its tributaries.
- Working in the Park, an attempt to put derelict sites, formally occupied by mines, iron and steel works, to new uses.
- New Uses for old industrial buildings.
- New Housing Projects based on the general agreement, that no green spaces should be used as construction sites.

In total, about 120 projects were implemented. With considerable efforts the IBA demonstrated that ideas can be realized, that urban problems have been turned into assets. Today obsolete industrial structures and collieries are better-valued and seen as assets of a region, where architectural heritage is scarce and the landscape not an aesthetical asset. The initiative contributed much to change the dreary image of the industrial region. It reinforced the regional identity and caused many citizens in the Ruhr to look beyond their local churchyards and travel to other cities within the region to visit new landmarks and attend cultural events. Generally, cultural infrastructure, and cultural activities and events are seen as important dimensions of

sustaining quality of life in a post-industrial region. The IBA has also contributed to the fact that cultural and creative industries are now considered to be important elements of local economies and receive more political support. Without the achievements of the IBA, Essen (with the Ruhr) would certainly not have been successful to become selected as Cultural Capital of Europe 2010. The Government of North Rhine Westphalia has used the model of the IBA initiative to launch a smaller format of comprehensive, culture-led sub-regional development. Finally, the success of the IBA Emscher Park has triggered off other IBA exhibitions in Germany and abroad: Hamburg, Basel, Thüringen, Heidelberg, Sachsen-Anhalt and most recently in Vienna (Kunzmann, 2018).

(a)

(b)

(c)

(d)

Figure 4-1: *Ruhr's area regeneration: (a) The ecological regeneration of the Emscher River, (b) The Landscape Park Duisburg – Nord is a popular tourist destination, (c) Zeche Zollverein turned two shipping containers on the former coking plant site into a swimming pool, (d) Water elements make a playful area for children*

4.2 IBA Fürst-Pückler-Land and LMBV as a dedicated company for rehabilitation – Germany

4.2.1 Genesis of creating a program or institution for the regional revitalization

The region of Lusatian Basin located in Eastern Germany on the boarders of Saxony and Brandenburg lands, is widely known of having large seams of lignite which was primary source of fuel in Germany since the beginning of exploitation in mid-19th century until the 1990s. The process of extraction caused the economic, social and industrial growth of the area (Heer et al. 2020). However, the Reunion of Germany in 1990 and the process of restructuring the industry afterwards brought this period of prosperity to the end.

After the massive closings of coal mines all across the Germany the local community was left not only with devastated environment and old infrastructure, but also with significant increase in unemployment. 79,000 people were employed in 17 mines and after the restructuring only 5 remained open and hired 27,000 people (Ostręga, 2013). The process of revitalization had to be well-thought, complex and successful, to reduce the negative environmental effects that mining had caused and provide workplaces for unemployed. Because of that the local community decided to create special company to execute the process of revitalization of Lusatian Basin with help of experts to ensure the result will be profitable.

4.2.2 Organizational and financial form of the program or institutions

A company created for mine closure and reclamation purposes was LMBV (Germ. Lausitzer und Mitteldeutsche Bergbau-Verwaltungsgesellschaft mbH), founded in 1994, with main target to prepare the post-mining land for future actions related to revitalization (Ostręga, 2013), and was financed by government (Scholz, 2010).

Then, in 1998 the company IBA (ger. Internationale Bauausstellung Fürst-Pückler-Land 2000–2010 GmbH) was founded. It belongs to the Cottbus city with county rights and four other counties – Dahme-Spreewald, Spree-Neiβe, Oberspreewald-Lausitz and Elbe-Elster. The structure of company is present in Figure 4.2. The work of individual departments of the IBA company was supported by: Gesellschafterversammlung (government of Cottbus and local authorities), Fachbeirat (26 experts in fields of science related to revitalization), Projektbeirat (members of local self-government, StuBa (commission of budget and guidance), representatives of LMBV and Regional Planner Group). The company's main target was to prepare plans for revitalization of Lusatian Basin while also taking into account needs of local community.

IBA was financed not only by the budget of Land of Brandenburg, Ministry of Infrastructure and National Planning, Wirtschaftsregion Lausitz GmbH and IBA owners, but also by European Union. The annual budget was 1,4 million € (Cała et al. 2019). IBA also raised funds from the deal named "Administrative contract related to recultivation post-mining areas of lignite", concluded between federal government and region of Lusatia. It is said that by 2020 the national government will have allocated 12 billion € for the purpose of revitalization of areas of lignite mines. More than half of this sum is supposed to be donated to Lusatian Basin and used to stabilise the harsh conditions of soil on post-mine areas (Heer et al. 2020).

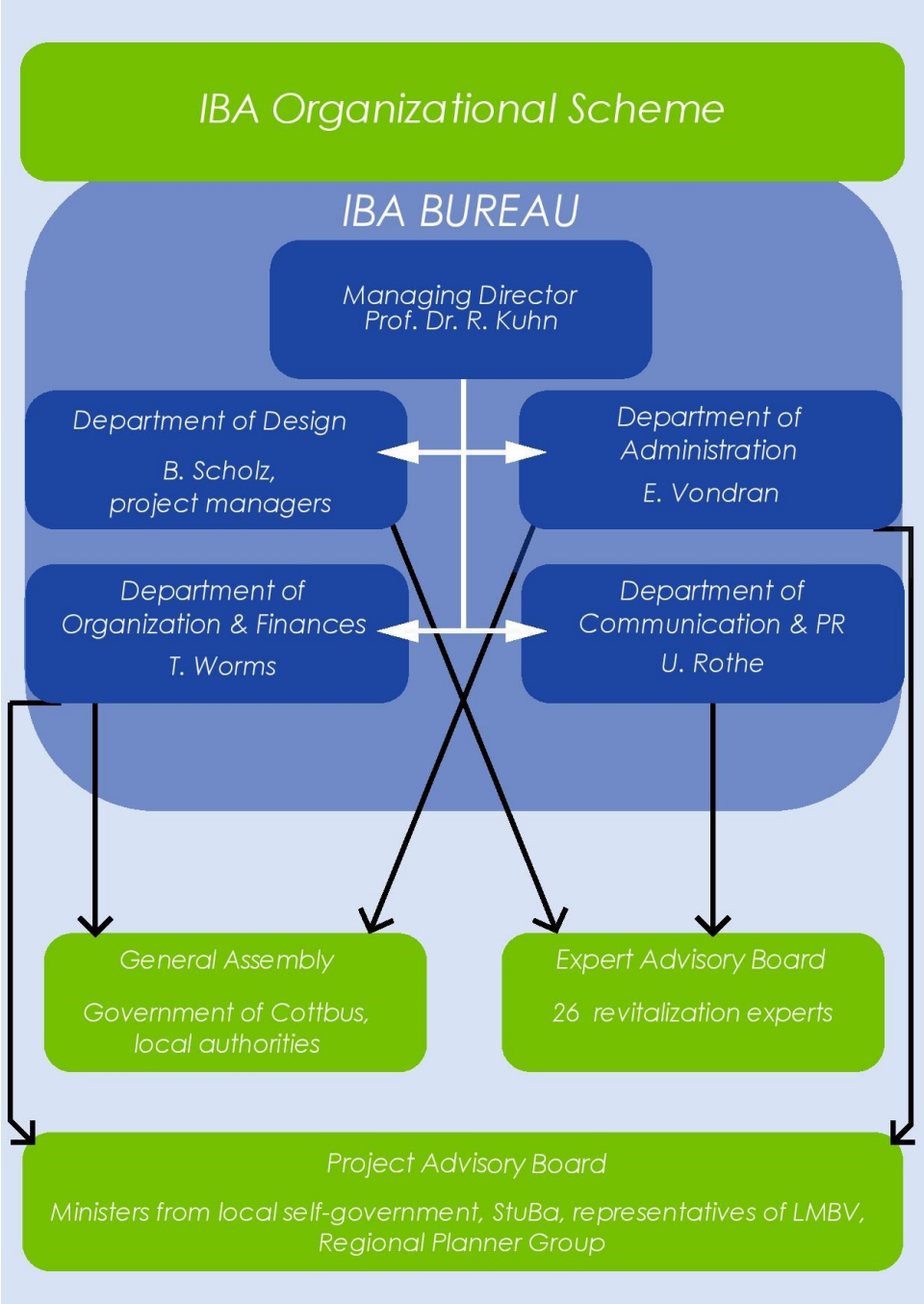

Figure 4-2: *Organisational structure of IBA Fürst-Pückler-Land*

4.2.3 Effects

One of the first steps in the revitalization process was turning the open pits into the reservoirs. LMBV turned those pits into 9 reservoirs with total surface area of 13,000 hectares. They were connected by network of 13 canals with total length of 9 kilometres, that could be used for sailing (Heer et al. 2020). This action turned the Lusatian Basin into the largest lake district created by human in Europe (Ostręga, 2013), therefore raising the tourist attractiveness of this region, and also paved the way for future actions performed by IBA.

After proper research done with experts IBA prepared 30 projects of revitalization, for already closed mines and for those which are still working today as well (Ostręga, 2013). Most of the work, however, was done in the years 2000-2010. The main focus was set on the post-mining areas and technical infrastructure, with task of not only preserving the unique character of those places, but also toturning the area into centre for business, tourism and culture – those 30 projects were grouped in 9 characteristic " landscape islands", each representing local factor – for example Polish-German partnership or the industrial heritage of this region (Cała et al. 2019). Many view platforms were built around those reservoirs, for example Rastiger Nagel or IBA Terrasse in Großräschen with unique floating architecture. The locations of former villages, relocated due to expansion of lignite mines, were commemorated with boards containing old photos and maps. Small harbour was built on the Senftenberg Lake. Other projects, not related to reservoirs, were for example Industrial Park in Senftenberg City, briquette factory "Louise" in Domsdorf or Bio-towers in Lauchhammer.

IBA has also prepared ten principles of successful revitalization of post mining areas, based on the experience they have gained while working in the Lusatian Basin. Main purpose of this action was to create an basic pattern for future projects in Germany – "in the development of post-mining landscapes, social, economic and ecological matters must be balanced" (Scholz, 2010). Those principles are defining the basic targets of successful revitalization process. However, they do not form universal strategy, that could be applied to any area on the globe, because every degraded place requires individual approach.

Another success of this project was great marketing of freshly revitalized Basin, which gained worldwide fame and attracted attention as a place that provides education for students. Former administrative building of Meuro Mine became known as House of Studies, where those, who are interested in gaining valuable experience can educate themselves with help of massive archive or participate in many internships organised by IBA today (Cała et al. 2019).

At the end, the local community was very pleased with the results of the cooperative work of LMBV and IBA. Germany has very specific approach to revitalization, which does not focus primarily on one place, but takes into consideration entire region and prepares a plan around it, which results in very successful projects with innovative methods being used, and the effect of attractive destination for visitors. Although the mining areas will not be able to earn a lot of money from tourism, the revitalization of this Basin built a foundation for further business and cultural development in the area.

4.3 Etablissement Public Foncier – France, a company dedicated to post-mining rehabilitation

4.3.1 Genesis of creating a program or institution for the regional revitalization

Many regions of France that were a subject of industrialization and mining operations have been heavily influenced by an economic crisis in the second half of the 20th century. Urban development confronted with rapid socio-economic changes that caused abandonment of industrial facilities and degradation of the natural environment elevated the need to properly "recycle" land and redevelop it accordingly. One of the most industrialized regions of the 20th century, thus significantly contaminated and degraded, was Nord-Pas de Calais, where intense extraction and processing of hard coal took place. In effect, contamination of both land and

aquatic environment affected the region and 326 landfills were allocated (Ostręga, 2013). To improve physical and economic values of the area and bring it back into the real estate market, in 1984. the region has received state funding that helped to renovate infrastructure and remediate post-mining wastelands (Contrats de Plan Etat-Règion, CPER, 1984-1988). Still, there were many sites that could not find investors due to worse technical and environmental conditions as well as unfavorable location. In order to fully revitalize Nord-Pas de Calais, in 1990 it has been decided, by decree of the Council of State, to create EPF Nord-Pas de Calais – its main purpose was to properly manage such neglected areas (EPF-NDPC, 2020).

4.3.2 Organizational and financial form of the program or institutions

Although it has been proclaimed as a regional organization, Public Land Establishment Nord-Pas de Calais fulfills both regional and national duties in terms of revitalization. The organization acts according to the Multiannual Intervention Program (fr. Programme Pluriannuel d'Intervention Foncière; PPI) for years 2020-2024. So far, there have been many regional and thematic workshops (eleven in May and June 2019) and questionnaires for the partners of EPF that allowed them to collect their opinions on what is necessary for the revitalized territory.

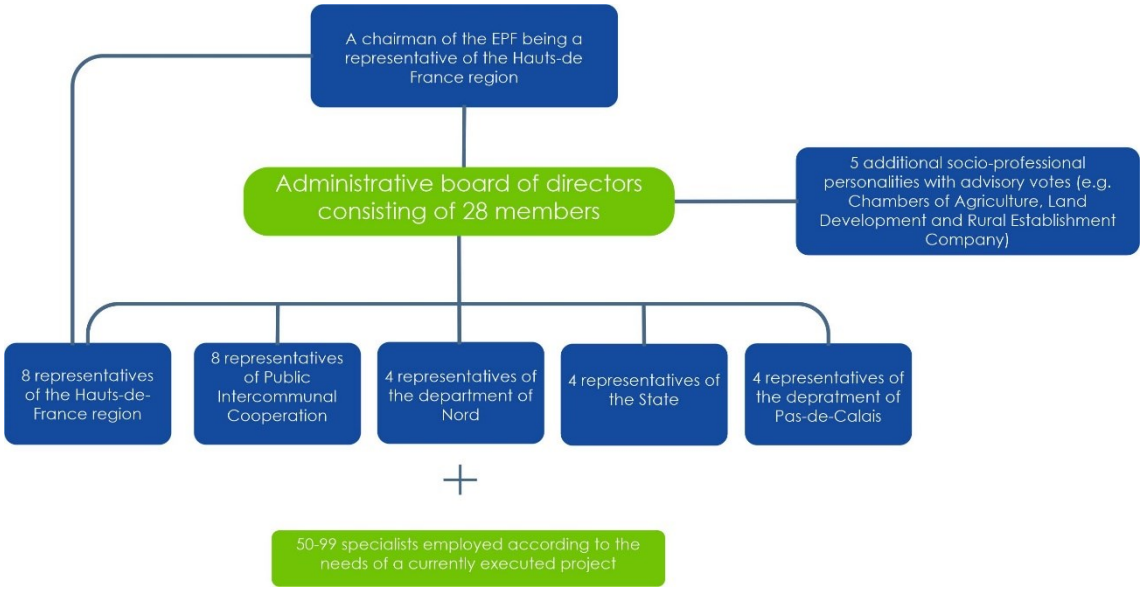

Figure 4-3: *Administration structure of Établissements Publics Fonciers Nord-Pas de Calais, source: own analysis based on EPF NPdC 2020*

Initially, EPF's team in 1990 consisted of five employees, although the amount rapidly increased as the need for engineering and revitalization specialists was raised for the reason that more projects were executed. In 2012, the organization hired sixty-five employees and the board of directors counted for thirty-two members (Ostręga, 2013).

Currently, the EPF NPdC is administered by the directing group of twenty-eight members belonging to specific branches. There are four representatives of the State's Ministries of Finances, Territorial Cohesion and Justice, as well as twenty-four members representing local authorities and socio-economic organizations. In addition to the established team, there are five socio-professional personalities with advisory votes representing external institutions such as Chambers of Agriculture or Land Development and Rural Establishment Company (EPF-NPdC,

2020). In 2018 there were 77 specialists working for the EPF, responsible for revitalization and socio-economic processes. Each year the number of employees estimates between 50-99 depending on the current stage of the Multiannual Intervention Program (EPF-NPdC Brochure, 2018).

Intervention carried by EPF is based on six stages, that are completed in a following order (Ostręga, 2013):

1) Signing the contract between EPF NPdC and a group of municipalities describing the reclamation strategy.
2) Negotiations and real estate (being a subject to reclamation) acquisition.
3) Property management (protection, taxes liabilities etc.).
4) Reclamation process (may include conservation of industrial heritage.
5) Selling of the reclaimed property to a municipality or an institution designated by the community (e.g. developer).
6) Monitoring of the reclaimed areas.

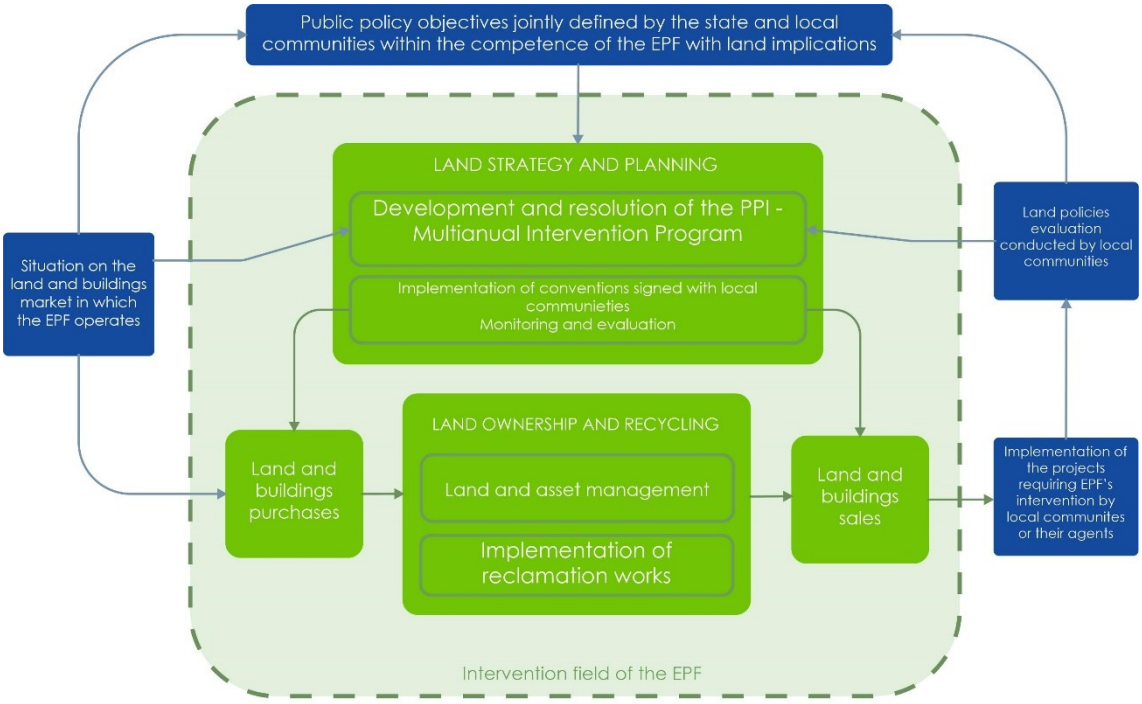

Figure 4-4: *Organisational structure of Établissements Publics Fonciers Nord-Pas de Calais, source: EPF NPdC 2020*

The main source of EPF's funds is the Special Equipment Tax (fr. La Taxe Speciale d'Equipement; TSE) paid by citizens and business owners in Nord Pas de Calais which allows the organization to acquire its own resources. It is an annual tax of maximally 20 € per inhabitant, although that amount is usually lower. Each year, the tax is set according to the current financial ceiling defined by law and planned strategy's needs. In 2018, funds received from the TSE accounted for 46% of all revenues (70,2 mln €). Additionally, EPF gains its resources from disposals of reclaimed land (30,6%), operating grants (12%) and less relevant income, such as reversals of provisions (11,4%) (EPF Recycleur de foncier en région, 2018).

Main expenses that EPF has to deal with are associated with land acquisition and its proper transformation. In 2018, real estate acquisition costs accounted for 30,2% of total expenses

(36,5 mln €), while management (it is: monitoring, structural reinforcement, insurance and security) takes up to 26,6% of the outlay. Additionally, there are significant site remediation costs including environmental studies, demolition, earthworks and treatment of pollution (16,6%). Other expenses involved fluctuations at a stock market (14%), staff costs (6,5%) and supplementary services (6,1%) (EPF Recycleur de foncier en région, 2018).

4.3.3 Effects

Public Land Establishment Nord-Pas de Calais's initial revitalization policy focused on remediation of post-industrial areas, concentrating on their biophysical aspects, which would consequently bring them back into the land market. However, since 1994, EPF NPdC has started to protect industrial heritage by preservation of the mining and railroad infrastructure. It concluded in appreciation of such objects as 9-9bis Mine in Oignies, Delloye Mine in Lewarde, 11/19 in Loos en Gohelle and Arenberg Mine in Wallers fully preserved as "memory sites" (Fig. xx). On top of that, since 2003 remediation has been conducted on 130 landfills from which secondary raw materials were recovered beforehand. It is worth mentioning that 51 of those landfills have been registered at the UNESCO World Heritage list (Ostręga, 2013).

Figure 4-5: *"Memory sites" of Nord Pas de Calais, fully preserved: a) 9-9bis Mine in Oignies, b) Delloye Mine in Lewarde, c) 11/19 in Loos en Gohelle and d) Arenberg Mine in Wallers (photo: A. Ostręga)*

Urban revitalization is an essential aspect of EPF's policy that has been implemented in Nord-Pas de Calais as well. In 2012, the community of Maroilles was engaged into the renovation project of the ancient, historical watermill and construction of Carrè des Saveurs, a place for

cultural and culinary events (EPF Recycleur de foncier en région, 2012). Application of temporary mesotrophic flower meadows at deconstructed sites in close proximity to urbanized areas helped at improving inhabitants' life quality and maintaining regional biodiversity (EPF Recycleur de foncier en région, 2018). By the end of 2018, Hazerbrouck's old train station has been readapted to its new functions – a bus station, commercial avenues, residential building and smartly designed parking lots (EPF Recycleur de foncier en région, 2017).

***Table 5-3**: List of reclaimed areas and costs, source: EPF NPdC*

Year	Number of operations	Reclamation area [ha]	Average reclamation area [ha]	Operation costs [€]	Average operation costs [€]
1991	14	653	46,60	10 982 276	784 448
1992	17	588	34,60	12 386 634	728 826
1993	14	306	21,80	8 720 844	622 917
1994	29	544	18,80	11 920 701	411 059
1995	42	493	11,70	14 053 053	334 596
1996	38	670	17,60	15 914 758	418 809
1997	28	361	12,90	11 748 526	419 590
1998	33	226	6,80	11 360 413	344 255
1999	19	246	12,90	9 141 559	481 135
2000-2003	48	451	9,40	28 654 440	596 967
2004-2006	37	402	10,86	40 000 000	1 081 081
2007-2011	53	81	1,52	21 500 000	405 660
2012-2014	224	230	1,02	186 800 000	833 928
2015-2018	-	484,5	-	293 100 000	-

After 30 years of efficient activity, EPF has managed to revitalize post-industrial, including post-mining areas of great significance for the natural environment of France, such as Monts de Baives, and give new life to many degraded urban regions. Thanks to those actions, much of the land has returned to the circulation in the real estate market and industrial heritage has been successfully preserved.

5 MODEL OF REVITALIZATION IN THE POST-MINING REGION

On the basis of previous described experience an universal model of revitalization in the post-mining region is presented. The model is built on the basis of existing practices that have been already verified in European postmining regions:

- IBA Emscher Park together with NRW.URBAN as dedicated companies for rehabilitation and socioeconomic development – Germany;
- IBA Fürst-Pückler-Land together with LMBV as a dedicated company for rehabilitation – Germany;
- Etablissement Public Foncier – France, a company dedicated to post-mining rehabilitation.

Due to the inability to go on a study visit to Netherlands, the analysis of the IBA Parkstad project was omitted at this stage.

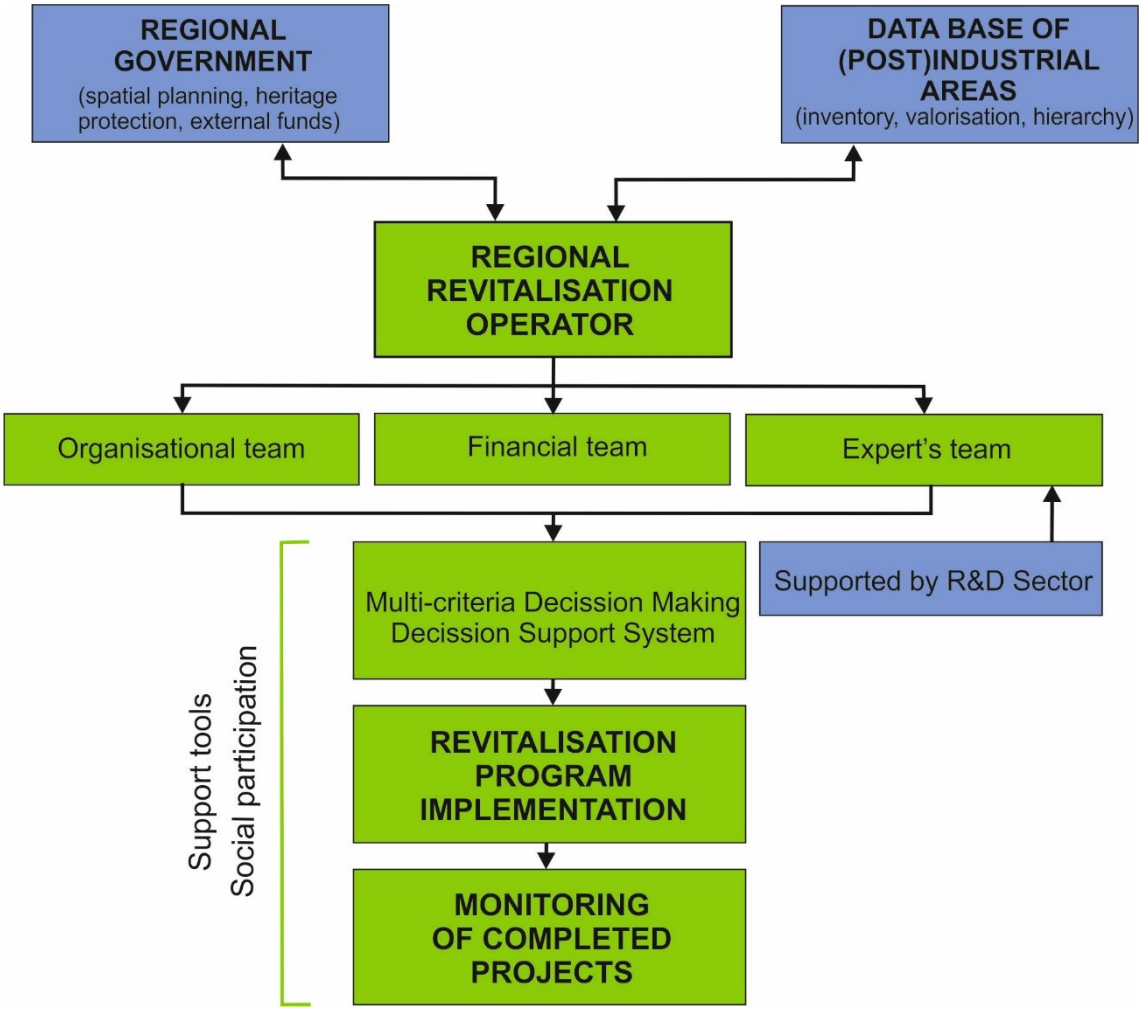

Figure 5-1: *Model of revitalization in the post-mining region*

A list of tools which were identified in the course of study and can be useful for model is as follow:

organizational	formal establishment of regeneration programs at the regional level (by the government, special regulations);
	establishing companies to organize revitalization programs;
	inventory and database of post-industrial areas
formal-legal	the principle of priority in the development of post-industrial rather than green areas
financial	financial guarantees for rehabilitation
	special reclamation tax
	subsidies from external funds and beneficiaries' own contribution.

The proposed model will be subject to further verification under WP4, Task 4.2 as well as WP3 and 5.

6 CONCLUSION

This report shows the different approaches to remediation and revitalization in different RIS countries. The most organized activities were inventories of industrial heritage in Spain (described in Del. 1.1) and inventories of abandoned metal mines in Portugal. In Portugal there is comprehensive national strategy to reclaim abandoned metal mines. It include: inventory of 175 abandoned and degraded mining areas, baseline study with technical-scientific analysis to allow for a proper hierarchy of the sites, launching of works, positioning of the company for allocate funds, development of qualification assessments, master plans, environmental assessments and execution projects.

There are not many examples of revitalization, understood as a socio-economic revival, organized on a regional scale. The programs from the Ruhrarea, Lusatian Basin and Nord-Pas de Calais were presented as proven and worth following. All the experiments described, as well as the guidelines resulting from the Del. 1.1. were used to develop a model that is universal and can be used in various countries.

The implementation of task 4.1 also resulted in the preparation of drafts of scientific articles that will be completed in 2021 and published as part of disseminating the project results. However, it should still be discussed during the implementation of WP 3, 4 and 5.

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